SPW20N60CFD

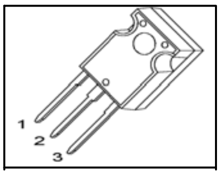
Cool MOS™ Power Transistor

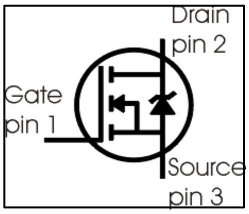
V_{DS} @ T_{jmax}	650	V
$R_{DS(on)}$	0.22	Ω
I_D	20.7	A

Feature

- New revolutionary high voltage technology
- Ultra low gate charge
- Periodic avalanche rated
- Extreme d*v*/d*t* rated
- High peak current capability
- Intrinsic fast-recovery body diode
- Extreme low reverse recovery charge
- Pb-free lead plating; RoHS compliant
- Qualified according to JEDEC[0)] for target applications

PG-TO247





Type	Package	Ordering Code	Marking
SPW20N60CFD	PG-TO247	Q67040-S4617	20N60CFD

Maximum Ratings

Parameter	Symbol	Value	Unit
Continuous drain current	I_D		A
T_C = 25 °C		20.7	
T_C = 100 °C		13.1	
Pulsed drain current, t_p limited by T_{jmax}	$I_{D\ puls}$	52	
Avalanche energy, single pulse I_D = 10 A, V_{DD} = 50 V	E_{AS}	690	mJ
Avalanche energy, repetitive t_{AR} limited by T_{jmax}[1)] I_D = 20 A, V_{DD} = 50 V	E_{AR}	1	
Avalanche current, repetitive t_{AR} limited by T_{jmax}	I_{AR}	20	A
Reverse diode d*v*/d*t* I_S=20.7A, V_{DS}=480V, T_j=125°C	d*v*/d*t*	40	V/ns
Gate source voltage	V_{GS}	±20	V
Gate source voltage AC (f >1Hz)	V_{GS}	±30	
Power dissipation, T_C = 25°C	P_{tot}	208	W
Operating and storage temperature	T_j , T_{stg}	-55... +150	°C

Maximum Ratings

Parameter	Symbol	Value	Unit
Drain Source voltage slope V_{DS} = 480 V, I_D = 20.7 A, T_j = 125 °C	dv/dt	80	V/ns
Maximum diode commutation speed V_{DS} = 480 V, I_D = 20.7 A, T_j = 125 °C	di_F/dt	900	A/µs

Thermal Characteristics

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Thermal resistance, junction - case	R_{thJC}	-	-	0.6	K/W
Thermal resistance, junction - ambient, leaded	R_{thJA}	-	-	62	
Soldering temperature, wavesoldering 1.6 mm (0.063 in.) from case for 10s	T_{sold}	-	-	260	°C

Electrical Characteristics, at T_j=25°C unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-source breakdown voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=0.25mA	600	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	V_{GS}=0V, I_D=20A	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	I_D=1000µA, V_{GS}=V_{DS}	3	4	5	
Zero gate voltage drain current	I_{DSS}	V_{DS}=600V, V_{GS}=0V, T_j=25°C, T_j=150°C	 - -	 2.1 1700	 - -	µA
Gate-source leakage current	I_{GSS}	V_{GS}=20V, V_{DS}=0V	-	-	100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=13.1A, T_j=25°C T_j=150°C	 - -	 0.19 0.51	 0.22 -	Ω
Gate input resistance	R_G	f=1MHz, open Drain	-	0.54	-	

Electrical Characteristics , at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Transconductance	g_{fs}	V_{DS}≥2*I_D*$R_{DS(on)max}$, I_D=13.1A	-	17.5	-	S
Input capacitance	C_{iss}	V_{GS}=0V, V_{DS}=25V, f=1MHz	-	2400	-	pF
Output capacitance	C_{oss}		-	780	-	
Reverse transfer capacitance	C_{rss}		-	50	-	
Effective output capacitance,[2] energy related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0V to 480V	-	83	-	pF
Effective output capacitance,[3] time related	$C_{o(tr)}$		-	160	-	
Turn-on delay time	$t_{d(on)}$	V_{DD}=380V, V_{GS}=0/10V, I_D=20.7A, R_G=3.6Ω	-	12	-	ns
Rise time	t_r		-	15	-	
Turn-off delay time	$t_{d(off)}$		-	59	-	
Fall time	t_f		-	6.4	-	

Gate Charge Characteristics

Parameter	Symbol	Conditions	min.	typ.	max.	Unit
Gate to source charge	Q_{gs}	V_{DD}=480V, I_D=20.7A	-	15	-	nC
Gate to drain charge	Q_{gd}		-	54	-	
Gate charge total	Q_g	V_{DD}=480V, I_D=20.7A, V_{GS}=0 to 10V	-	95	124	
Gate plateau voltage	$V_{(plateau)}$	V_{DD}=480V, I_D=20.7A	-	7	-	V

[0]J-STD20 and JESD22

[1]Repetitve avalanche causes additional power losses that can be calculated as P_{AV}=E_{AR}*f.

[2]$C_{o(er)}$ is a fixed capacitance that gives the same stored energy as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

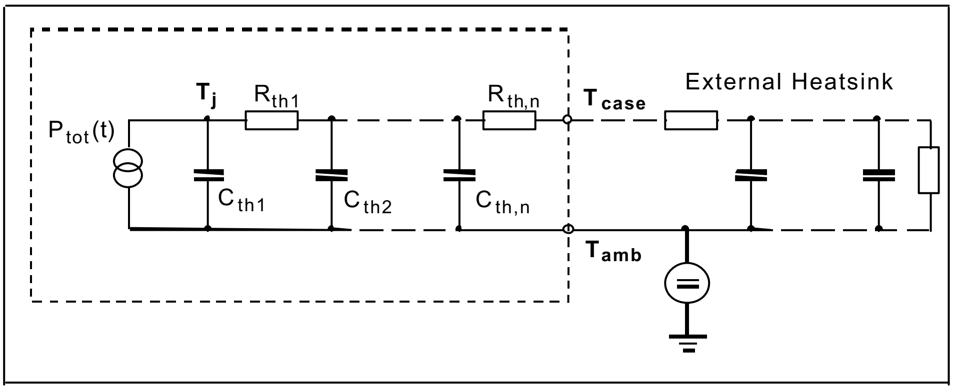
[3]$C_{o(tr)}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to 80% V_{DSS}.

Electrical Characteristics, at T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Inverse diode continuous forward current	I_S	T_C=25°C	-	-	20.7	A
Inverse diode direct current, pulsed	I_{SM}		-	-	52	
Inverse diode forward voltage	V_{SD}	V_{GS}=0V, I_F=I_S	-	1	1.2	V
Reverse recovery time	t_{rr}	V_R=480V, I_F=I_S ,	-	150	-	ns
Reverse recovery charge	Q_{rr}	di_F/dt=100A/µs	-	1	-	µC
Peak reverse recovery current	I_{rrm}		-	13	-	A
Peak rate of fall of reverse recovery current	di_{rr}/dt		-	1400	-	A/µs

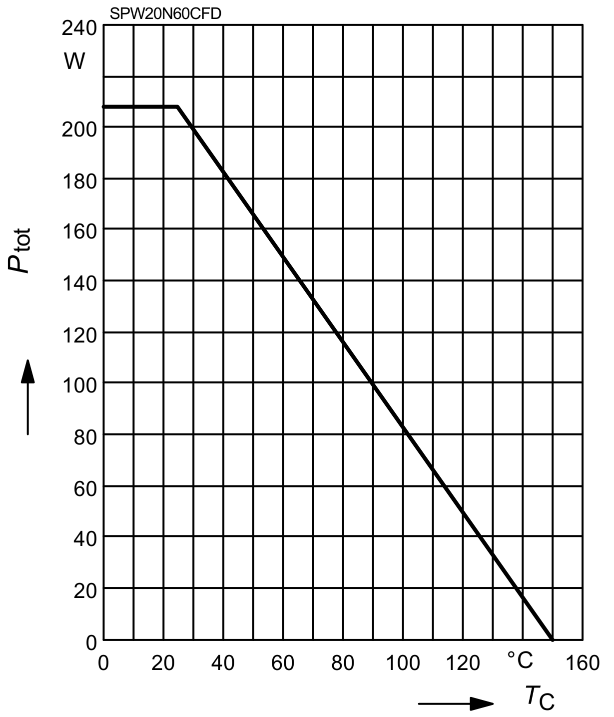
Typical Transient Thermal Characteristics

Symbol	Value	Unit	Symbol	Value	Unit
	typ.			typ.	
Thermal resistance			Thermal capacitance		
R_{th1}	0.007686	K/W	C_{th1}	0.0003764	Ws/K
R_{th2}	0.015		C_{th2}	0.001412	
R_{th3}	0.029		C_{th3}	0.001932	
R_{th4}	0.114		C_{th4}	0.005299	
R_{th5}	0.136		C_{th5}	0.012	
R_{th6}	0.059		C_{th6}	0.091	



1 Power dissipation

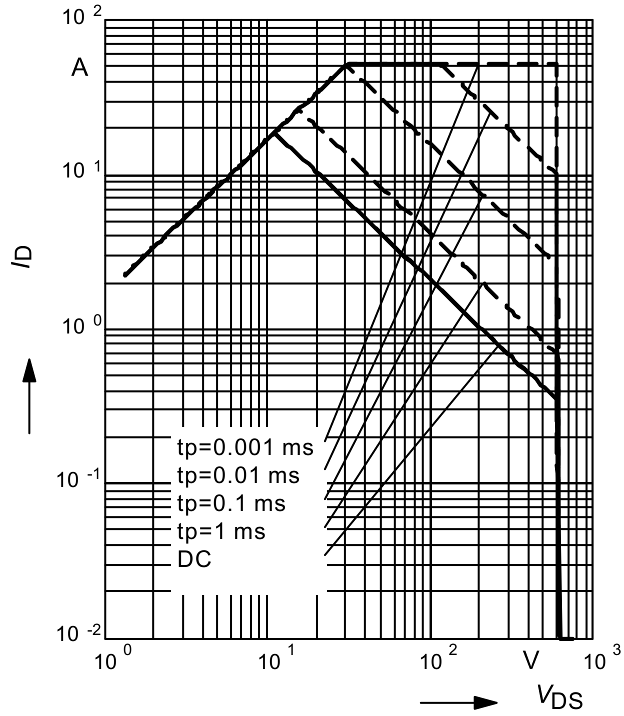
$P_{tot} = f(T_C)$



2 Safe operating area

$I_D = f(V_{DS})$

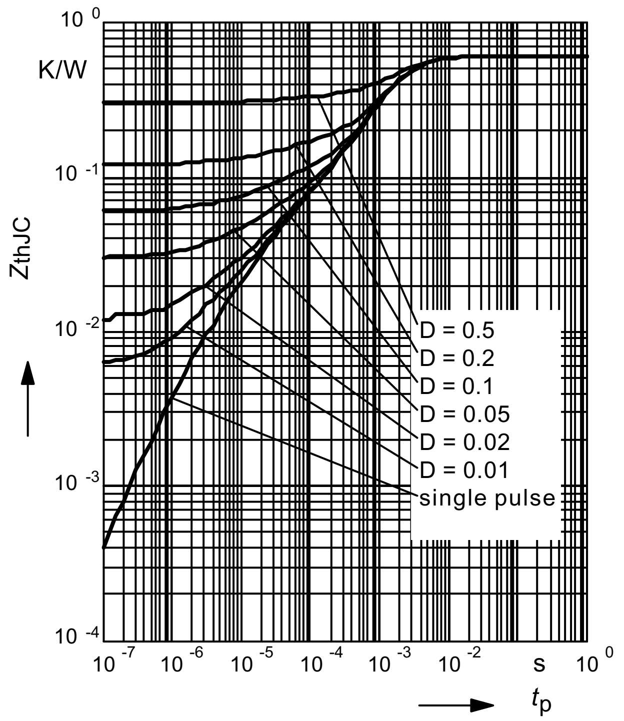
parameter : $D = 0$, T_C=25°C



3 Transient thermal impedance

$Z_{thJC} = f(t_p)$

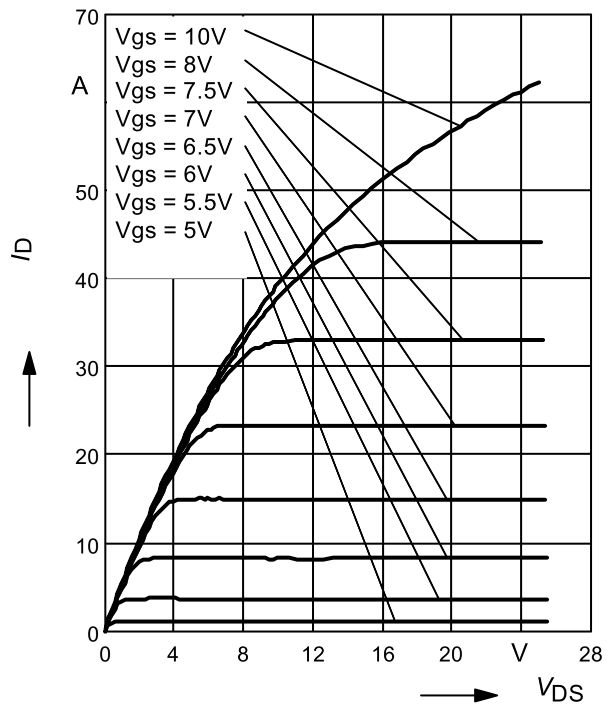
parameter: $D = t_p/T$



4 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=25°C

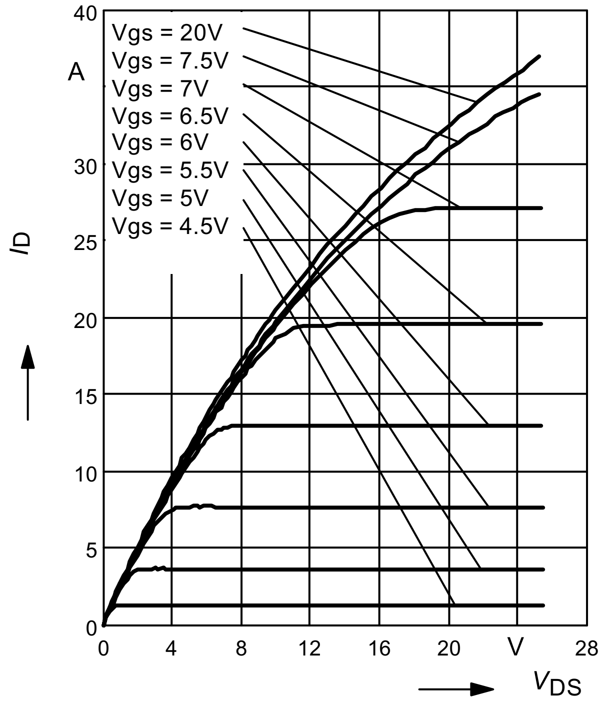
parameter: t_p = 10 µs, V_{GS}



5 Typ. output characteristic

$I_D = f(V_{DS})$; T_j=150°C

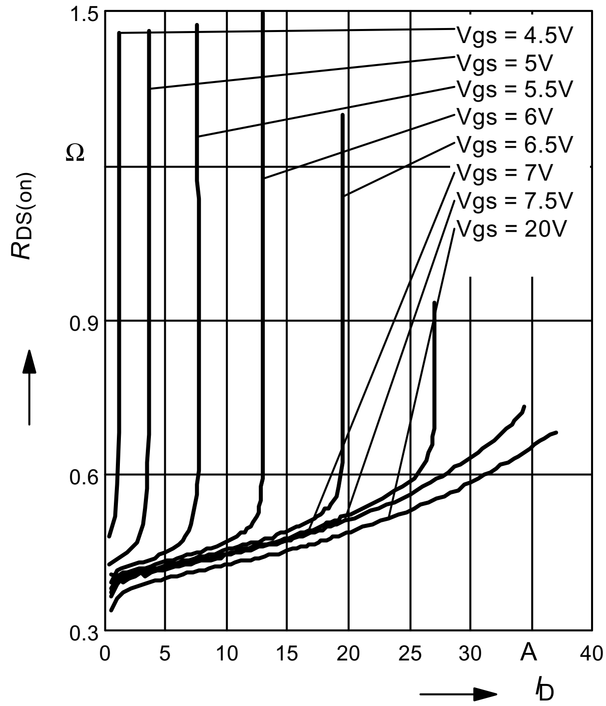
parameter: t_p = 10 µs, V_{GS}



6 Typ. drain-source on resistance

$R_{DS(on)}=f(I_D)$

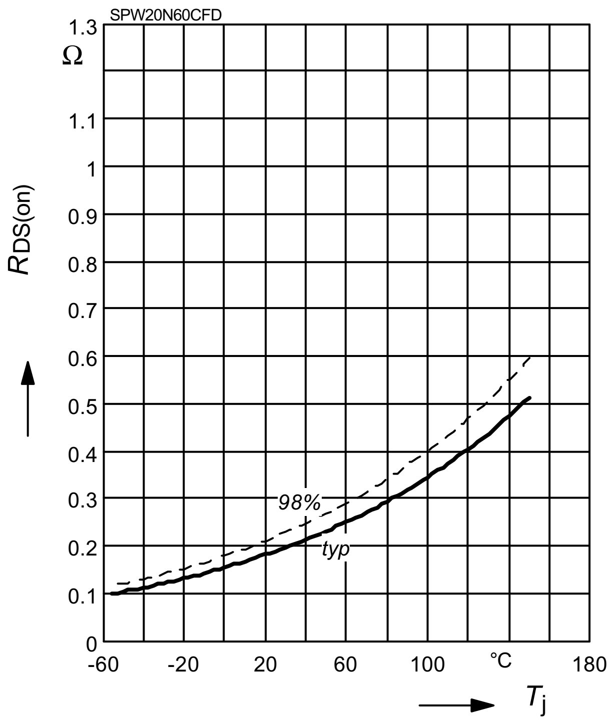
parameter: T_j=150°C, V_{GS}



7 Drain-source on-state resistance

$R_{DS(on)} = f(T_j)$

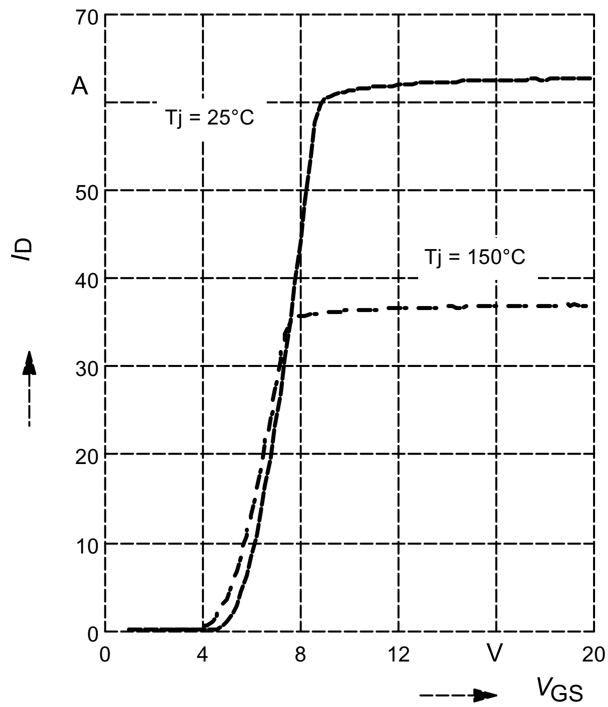
parameter : I_D = 13.1 A, V_{GS} = 10 V



8 Typ. transfer characteristics

$I_D= f(V_{GS})$; $V_{DS} \geq 2 \times I_D \times R_{DS(on)max}$

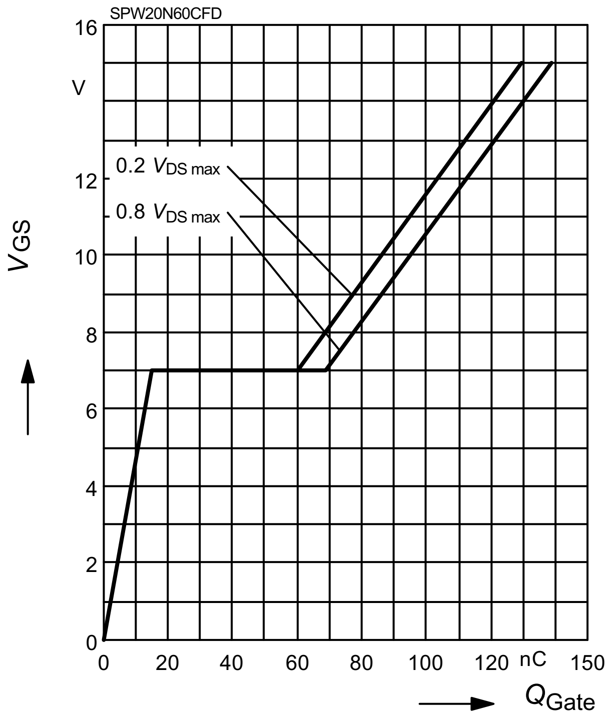
parameter: t_p = 10 µs



9 Typ. gate charge

$V_{GS} = f\ (Q_{Gate})$

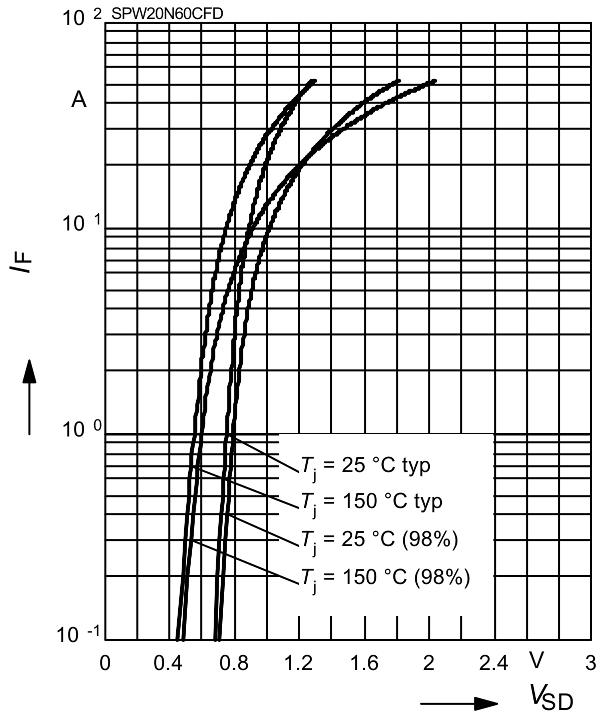
parameter: I_D = 20.7 A pulsed



10 Forward characteristics of body diode

$I_F = f(V_{SD})$

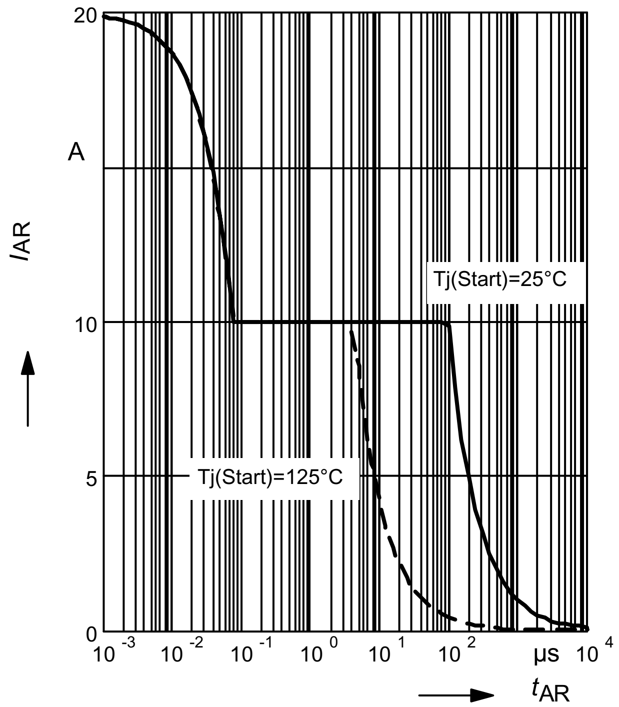
parameter: T_j, tp = 10 µs



11 Avalanche SOA

$I_{AR} = f(t_{AR})$

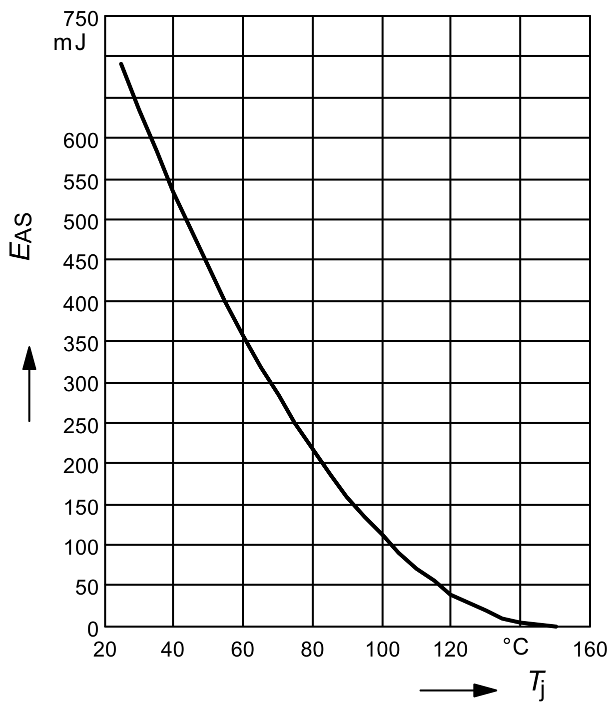
par.: $T_j \leq 150$ °C



12 Avalanche energy

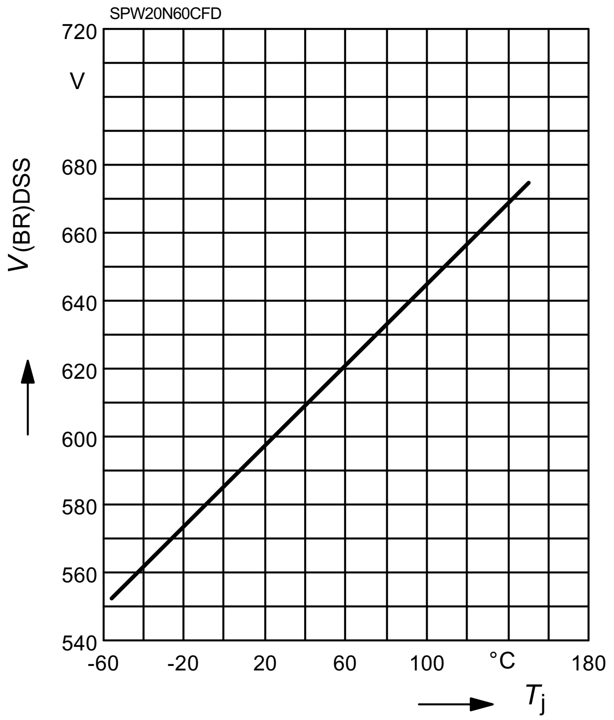
$E_{AS} = f(T_j)$

par.: I_D = 10 A, V_{DD} = 50 V



13 Drain-source breakdown voltage

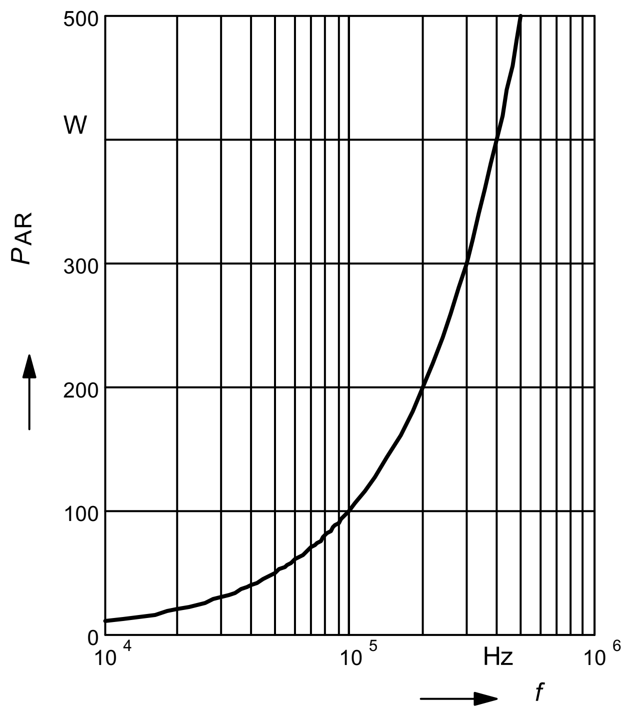
$V_{(BR)DSS} = f(T_j)$



14 Avalanche power losses

$P_{AR} = f(f)$

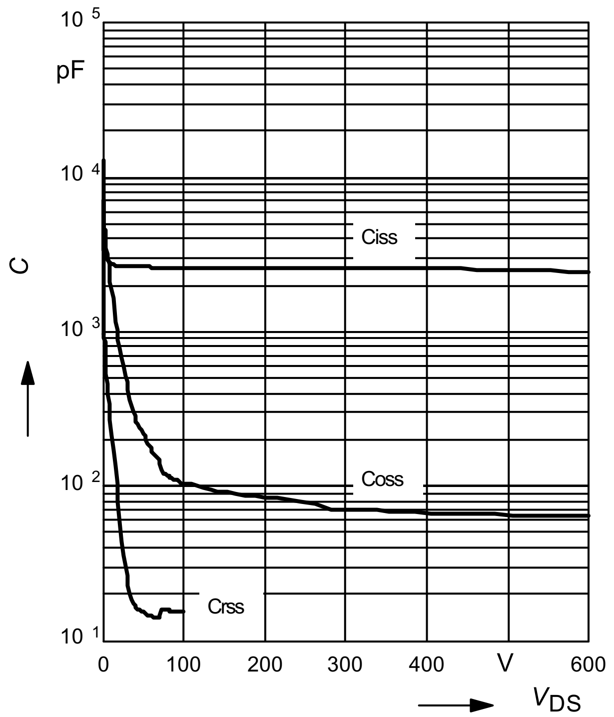
parameter: E_{AR}=1mJ



15 Typ. capacitances

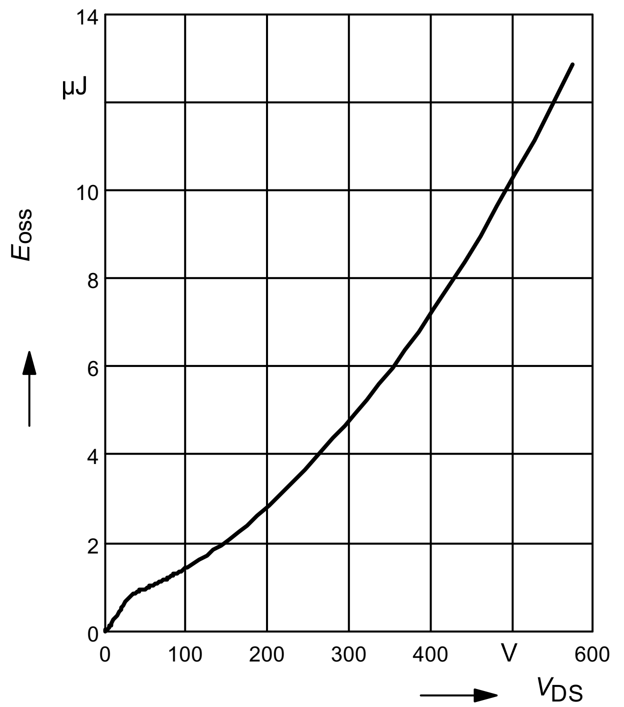
$C = f(V_{DS})$

parameter: V_{GS}=0V, f=1 MHz



16 Typ. C_{oss} stored energy

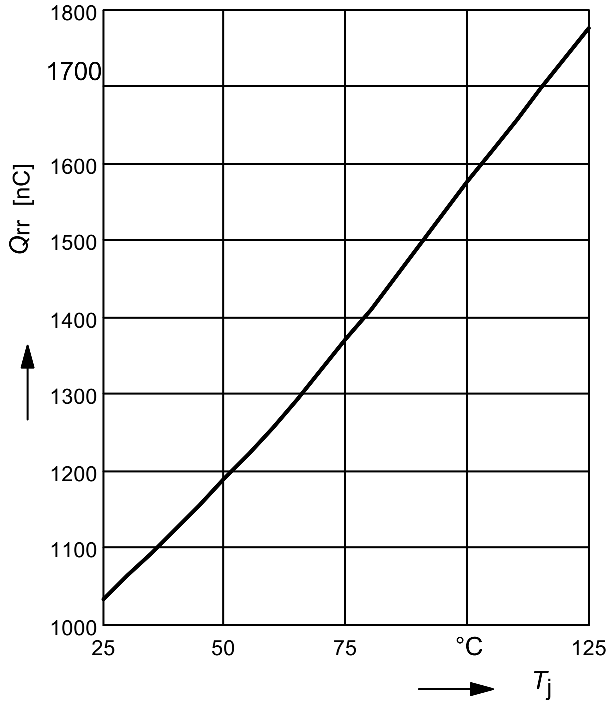
$E_{oss}=f(V_{DS})$



17 Typ. reverse recovery charge

$Q_{rr} = f(T_J)$

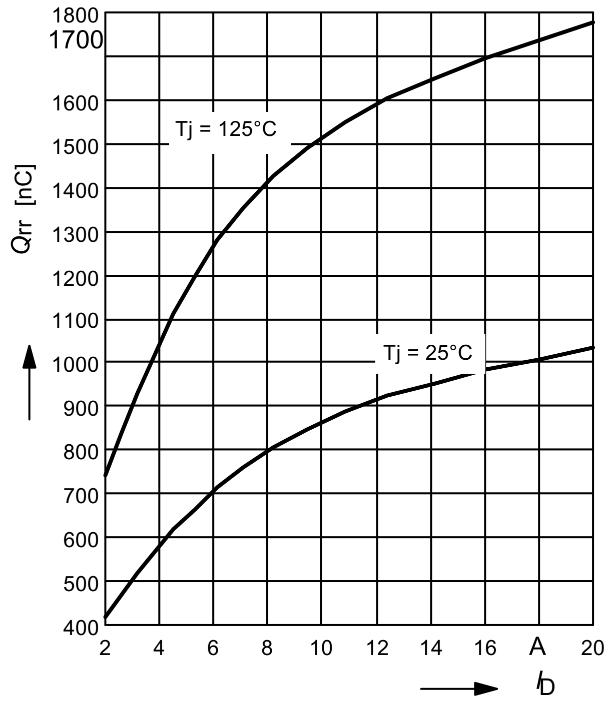
parameter: I_D = 20.7A



18 Typ. reverse recovery charge

$Q_{rr} = f(I_D)$

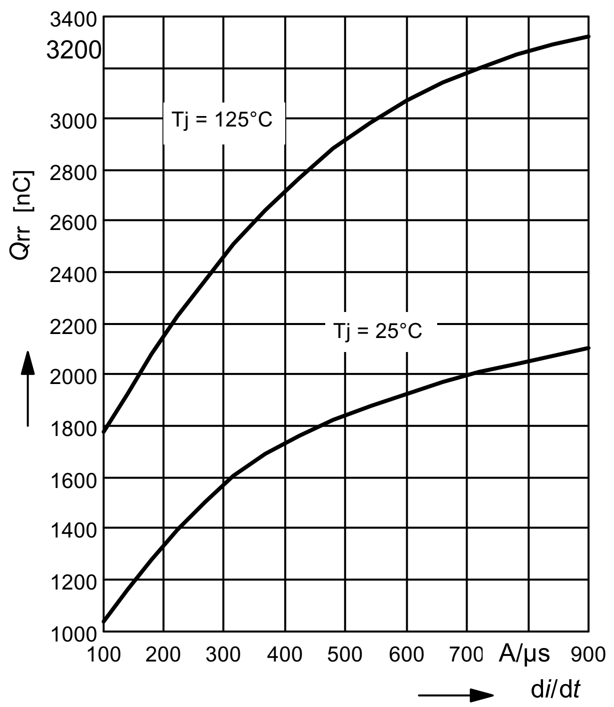
parameter: di/dt = 100 A/µs



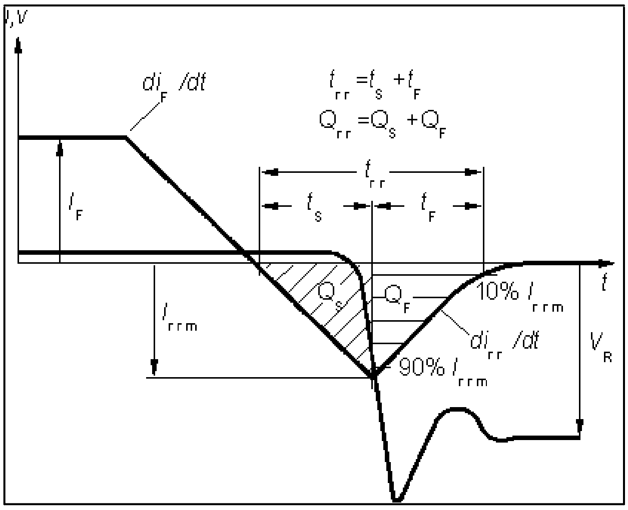
19 Typ. reverse recovery charge

$Q_{rr} = f(di/dt)$

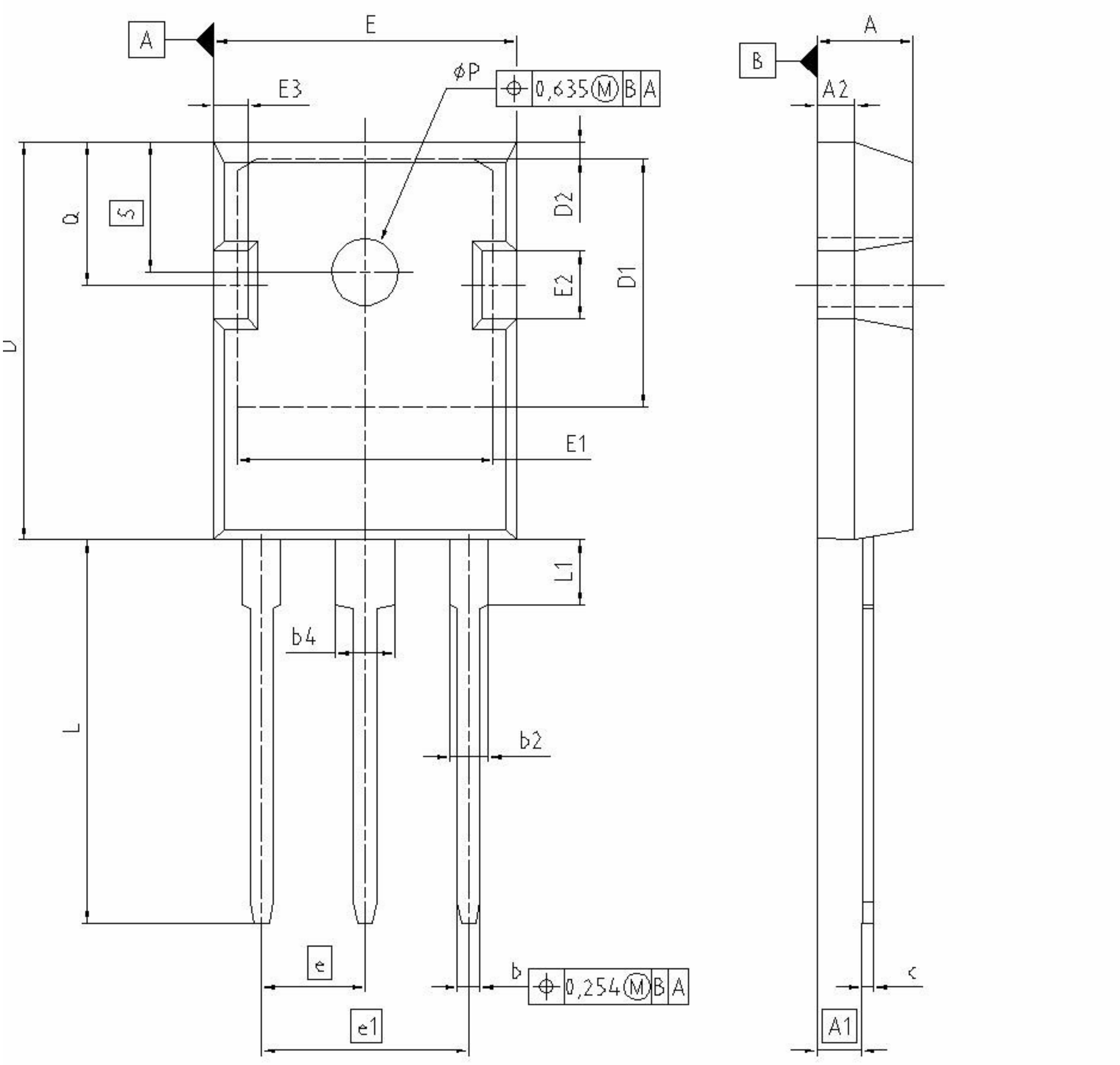
parameter: I_D = 20.7 A



Definition of diodes switching characteristics



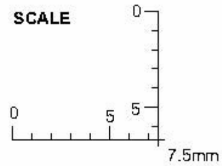
PG-TO-247-3-1



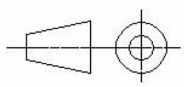
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.903	5.157	0.193	0.203
A1	2.273	2.527	0.092	0.096
A2	1.853	2.107	0.075	0.081
b	1.073	1.327	0.047	0.052
b2	1.903	2.386	0.075	0.094
b4	2.870	3.454	0.113	0.136
c	0.549	0.752	0.024	0.030
D	20.823	21.077	0.820	0.830
D1	17.323	17.831	0.682	0.702
D2	1.063	1.317	0.042	0.052
E	15.773	16.027	0.621	0.631
E1	13.893	14.147	0.547	0.557
E2	3.683	3.937	0.145	0.155
E3	1.683	1.937	0.066	0.076
e	5.450		0.215	
e1	10.900		0.430	
N	3		3	
L	20.053	20.307	0.789	0.799
L1	4.168	4.472	0.164	0.176
øP	3.559	3.661	0.140	0.144
Q	5.493	5.747	0.216	0.226
S	6.043	6.297	0.238	0.248

REFERENCE
JEDEC TO247-AD

SCALE



EUROPEAN PROJECTION



ISSUE DATE
28-06-2005

FILE
TO247_1

Published by
Infineon Technologies AG,
Bereichs Kommunikation
St.-Martin-Strasse 53,
D-81541 München

Attention please!
The information herein is given to describe certain components and shall not be considered as warranted characteristics.

Terms of delivery and rights to technical change reserved.

We hereby disclaim any and all warranties, including but not limited to warranties of non-infringement, regarding circuits, descriptions and charts stated herein.

Infineon Technologies is an approved CECC manufacturer.

Information
For further information on technology, delivery terms and conditions and prices please contact your nearest Infineon Technologies Office in Germany or our Infineon Technologies Reprensatives worldwide (see address list).

Warnings
Due to technical requirements components may contain dangerous substances.
For information on the types in question please contact your nearest Infineon Technologies Office.

Infineon Technologies Components may only be used in life-support devices or systems with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system Life support devices or systems are intended to be implanted in the human body, or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.